Technical Efficiency in the use of health care services in Punjab, Pakistan

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TECHNICAL EFFICIENCY IN THE USE OF HEALTH CARE SERVICES IN PUNJAB, PAKISTAN

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Abstract

The problem of scarcity of resources is the main issue in economics. That is why, the economist put stress on the efficient utilization of resources. These studies concoct to evaluate health meticulous technical efficiency of the utilization of resources in Punjab, Pakistan by using Data Envelop Analysis. Infant mortality and maternal mortality used as outputs of the model and per capita health expenditure, number of doctors, number of beds, maternal and child center, BHU, RHU, birth attended by skilled worker were used as inputs. The outcomes proposed that merely 43 % of districts found proficient and 57% of districts used their resources inefficiently. In case of sensitivity analysis, 69% of total districts were found efficient technically and they used the resources optimally. While due to the excess resources 31% of the districts were found inefficient. Deprived area should be given the priority and in order to achieve the Sustainable Development Goals (SDGs) resources should be allocated efficiently.

Keywords: scarcity, technical efficiency, Data Envelop Analysis (DEA), Sustainable Development Goals (SDGs)

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I. Introduction

Economic growth is a prime object of every nation. Growth is the issue of developing economy but not the developed economy, because they already achieved growth. It was an old concept that physical capital is an important determinant of economic growth. New theories of growth rejected the old phenomena of growth. New growth theories stress on the concept that growth is not only a function of physical capital formation but it also depends on human capital formation which is more important than former. Human capital formation is possible through investment in men. Investment in education, health and social sector are the sources of investment in men. Now the question arises, which sector, health, education and social sector, is important for investment in men. When we talk about the education, it increases just ability of the human capital not the working power of the human capital. If worker is not fit, then education cannot support him. Similarly social sectors can only provide the incremental support for the growth. If worker is not physical fit, education and social factors cannot increase its productivity. So, healthy workers are necessary for the growth process. Investment in health should be priority area for policy maker. Health is the main source for achieving economic and social development. Healthy workers remain strong physically and mentally. Life expectancy also increases by good health (Arora, 2001; Mayer, 2001).

Sustainable Development Goals (SDG), new extension of the MDGs, signed by 189 countries of the world in 2000. Half of these goals related with health. Therefore improvement in health condition of the people is the primary objective of country. Sri Lanka was the only country who fulfil the MDG and record the envy of south Asia The health conditions of Pakistan is worse as compare to other developing countries. For the socio economic development there is need to enhance the health investment. In the world there are many family bureau for health and peri-natal societies in different countries. The prime objective of government policies is to increase the welfare of people by increasing health expenditures. But in recent days, every country of the World has financial constraint. Due to the scarcity of resources, the efficient utilization of the resources is the main objective of policy maker. Here, the question arises how and where the utilization of resources is efficiently utilized. There are thirty six districts of Punjab. It shows that avertable deaths are taking place in female population, due to pathetic and poor quality of pregnancy care as well as low preference given to females in access the health care and units of health care. Literacy

levels in Punjab are particularly low in rural areas. Access to piped water does not even in the reach half of the population and much worse in rural areas. According to the data or provincial figures urban Punjab performs better on literacy, safe water; sanitation and housing, there are massive inequity within urban areas and quick growth of low earnings. House possession on the contrary is better in rural areas with much lower house ownership rates in urban Punjab and resultantly higher demands on cashable income. Punjab province has relatively high extent of population in both the low and high wealth one fifth of the population; imply that the province has comparatively fewer middle class households. The health's resources distributions among districts are unequal and urban biased. In this study, analyze the allocation and utilization of the health resources among districts of Punjab

II. Health Status of Punjab

Mostly the performance of a health system is analyzed by demographic statistics. The rate of Infant mortality and expectation of life are main indicators of health sector. On the basis of the information related to these indicators Health status of the Punjab is not much satisfactory. Almost 34% children were malnourished in Punjab. Following table provide an overview of Punjab' health status.

Health Care Services in Punjab

In the provision of health care services public sector play important role. In case of Punjab health facilities have gradually improved over the time period.

Table 2 provide the complete picture of health services in Punjab

FACILITIS	2007	2008	2009	2010	2011	2012
Doctors	43334	45487	48065	50302	52531	55098
Nurses	34467	35889	37574	39023	40700	42324
LHVs	6706	6784	6994	7345	7750	8366
Midwives	3628	3769	5173	5340	5560	5737
Dentists	2170	2450	2664	2888	3229	3551
Hospitals	1539	1533	1641	1641	1585	1612
No. Beds	35329	35272	36585	36585	37167	38011
R.H. C.	---	---	---	---	295	334
B.H.U.	---	---	---	---	2456	2535
M & C C.	---	---	---	---	492	349

Source: Punjab Development Statistics 2011-12

One doctor per thousand persons is the international standard but in case of Punjab doctor per thousand persons is below.

Health Care Expenditure in Punjab

Health expenditure done by the government is most essential for healthy nation. In Punjab, the government health expenditures are increasing but not hopeful figures in last six years. The whole story of public expenditure presented in following table

Table 3: Punjab Public Health Expenditure (Million Rs.)

Year	Original Allocation	Revised Allocation
2007-08	3290	3499
2008-09	4300	4369
2009-10	6500	6901
2010-11	9000	9278
2011-12	12525	=

Source: Punjab Development Statistics 2011-12

At the same output level. Therefore, there is need to determine the herald of health care policies are needed to be analyzed in increasing the altitude efficiency in health care provision at the level of province.

This complete information of health sector highlights the problem of limited resources. Government wants to use these resources in such a way that maximum targets can be achieved. In this study it is try to find out efficient utilization of health resources in thirty six districts of Punjab.

III. Problem statement

Due to the scarcity of financial resources, the control of expenses of health are important aspects for public policies. This is so because policy makers would be expected to decrease the public expenditure at the same level of output. Therefore there is a need to investigate the health institutes role and policies are needed to be analyzed in increasing the higher efficiency level the province. Punjab is the populous province of Pakistan. For increasing demand of health care services in Punjab, there is needed to be utilize the limited resources efficiently.

IV. Review of Literature

The basic objective for the review of literature is to get the awareness about the relevant researches of health care spending and its consequences which had been done previously in

different decades, particularly the speculation in the health sector and the output results in the health care service's efficiency. That is why, in order to know the importance of financing on health the review of literature is very effective. It gives a chance of comparison with other study in Pakistan and somewhere else.

Health sector efficiency measured in my research. These analyses give us a guideline for current study. Efficient health system is the prime object of every nation. Efficiency of health system depends on the deployment of health resource and provision of health budget according to the public preferences (Ravangard, R. et al. 2014). Efficiency measures by using Stochastic Frontier Analysis (S.F.A) and Data Envelop Analysis (D.E.A) . The method which is non-parametric is DEA, while the method which is S.F.A is parametric. DEA has some benefits over SFA. That is why many researchers use DEA in their analysis. DEA methodology uses some inputs and outputs of production process for measuring efficiency. Inputs and outputs should not be in monetary term but in physical term. Now the question arises there is some other environmental factors which also affect the efficiency of any system how we capture these factors in efficiency analysis. For this purpose two stage DEA use to capture the effect of environment factors on efficiency. In first stage, technical efficiency calculate by using DEA and in second stage some environmental factors regress on efficiency score in order to find out the most affective factors. Hadad, S., et al., (2013) measured the technical efficiency by using two model, in first model life expectancy used as an output while in second model infant survival rate were used as output. They found First model efficient and second inefficient. Some other factors regress on efficiency score of these two models and found that gate keeping and the multiple insurers lead to lower efficiency; and the ambiguous relation was found between socioeconomic and environmental factors. Similarly, in other two stage analyses done by Sebastian and Lemma (2010) in order to find out the factors associated with efficiency. The result showed that out of 60 posts, 15 efficient and 38 posts were at scale of product. They also found that health expenditure was not an affective in increasing efficiency. For measuring the allocation and efficiency of cost, DEA was applied on public and private institutes in Zambya by Masiye et al. (2011). It was found that the ratio of technically inefficient institutes of health were 84 % and 87% were allocated inefficient in cost. It was found that private health facilities were most effective than public. If policy maker want to increase the efficiency, they should make appropriate policy and also play role in implication of these policies. These policies

are developing public insurance, making organizational modifications, the preventive measures and improving life style can increase the efficiency of health expenditure (Ghaderi, H., et al., 2012). In case of primary care DEA needs further improvement in order to solve the intricacy which relates primary care results (Pelone, F., et al. 2014). Revenue from the grant also did not increase the efficiency of health center but it had negative relation with technical efficiency of inefficient health centers (Peter R.,et al., 2013). Policy makers should consider tying grant revenues should be considered as performance indicators by the policy makers. Regional level health care efficiency is subject of spatial dependence. This issue addressed by Felder, S. and Tauchman, H. (2013). It is found that positive efficiency spillovers have less effect on more efficient states. In the provision of health the primary care centers are playing an important role in the services of health provision. The characteristics of patients also affect the efficiency of primary care center. It has negative and significant effect on efficiency estimates (Ferrera, J. M. C., et al., 2014).

There is need of such type of study in Punjab, Pakistan. Because Punjab is most developed province in Pakistan as compare to other provinces. It is necessary to analyze the efficient utilization of health resources in Punjab. In this study, the dependent variables are I.M.R (infant-mortality rate) and M.M.R (maternal-mortality rate) are dependent variable while, Numbers of Beds, number of dispensaries, doctors, B.H.U, L.H.Vs, maternal & infant's centers, skilled birth attendant and per capita government health expenses are used as independent variables to analyze efficiency of health care services in Punjab. Data was taken from MICS 2011-2012

Explanation of Data

For efficiency analysis we use some output and inputs which is explained as follow.

Maternal-Mortality rate (M.M.R)

MMR=Number of Women's death count/100,000 live births

Infant-Mortality Rate (I.M.R)

The number of death count among 1000 live births earlier the age of one year.

In this study, the below mentioned variables will be utilize as inputs for analysis

P C GHE	Development and Non development government health expenditure is divided by the population of the each districts of the Punjab
N DOC	number of the doctors of each districts of the Punjab used as input
N BED	Total number of beds in each districts of the Punjab
M&CCs	Maternity & Child Health Centers in each districts of the Punjab
BHUs	Basic Health Units in each districts of the Punjab
RHCs	Rural Health Centers in each districts of the Punjab
DISP	Dispensaries in each districts of the Punjab
WSAB	Proportion of live birth attendant by skilled personal
LHV	Number of Lady Health Visitor

V. Methodology

To estimate the technical efficiency of all districts of Punjab, the following inputs are used

Design of the Study

There are two basic concepts for the analysis of output. They are very different from one another but they reckon the same. Correspondingly efficiency is normative & descriptive measure of performance (Ray, 2004). There is two parts of the study.

- Technical efficiency
- Sensitivity analysis.

Following figure 2 explain the complete sketch of the methodology

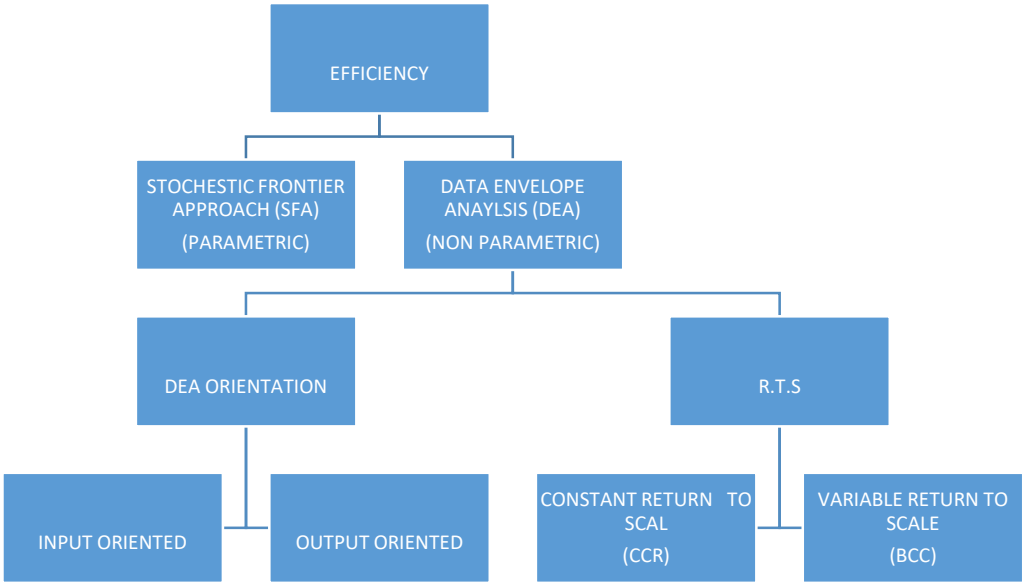
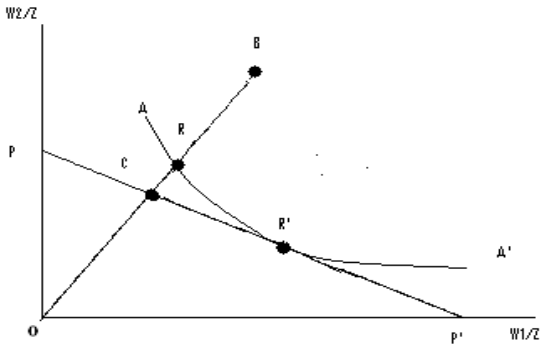


Figure 2 Methodology

Efficiency

Efficiency is a comparative analysis in which output of a firm is compare with the reference firm. Efficiency is define as with given level of inputs and technology, it is the maximum output of a firm. SFA and DEA are two basic approaches for measuring efficiency. The main advantage of DEA is free from functional form. Main contribution in DEA was done by CCR (1978). After Farrell works they used DEA for measuring efficiency for first time. After that a lot of efficiencies analysis was done by using DEA.

Input/output oriented are two orientations of DEA (Farrell, 1957). Input leads minimum input at given output while output oriented maximum output at given input (Farrell, 1957)



In Figure 3.1 B, R', and R show the same output level with different inputs combination w1 and w2. R and R /, represent efficient firm. B shows

Technical efficiency

The least possible proportion of input combination which is needed to generate the certain output, comparative to the perceived input for similar level of output is known as technically efficient.

$$T.E = OR / OB$$

Measurement of Technical Efficiency

As we already know that measurement of technical efficiency is the product of allocate efficiency. For measurement of economic efficiency first we will calculate technical efficiency by using following DEA models.

Sensitivity Analysis

For measuring the total efficiency the sensitivity analysis is also used for this purpose with the help of DEA. In this part the sensitivity analysis done on constant output of Punjab with previous inputs.

$$\min_{\theta\lambda} \ \theta$$

$$\text{subject to} \quad -y_i + Y\lambda \geq 0,$$

$$\theta x_i - X\lambda \geq 0,$$

$$\lambda \geq 0$$

VI. Results

Basic objective of the efficiency analysis is differentiating the efficient and inefficient districts. Efficiency analysis also highlights those districts in which resources are in surplus. In other words, we can say this study find out those inputs whose marginal productivity is zero. In order to make the districts these resources shuffle in efficient districts. Because they utilized their resources optimally. It means there is also some capacity to observe some resources. Misallocations of health resources were found in advance districts such as Rawalpindin, Faisalabad, Gujrat, Sarghoda. . Whereas back-word districts like Hafiz abad, Bhakker,Layyah, Pakpatan,Rajan pur, Narowal Khusahab, used health facilities optimally and efficiently. The null hypotheses is not rejected under these results because of the health expenditure per capita and it also improve the efficiency score in health services.

Table 4. Technical Efficiency Scores

DEISTRICTS	EFFICIENCY SCORE	%REDUCTION INPUT
Attock	0.84	16
Rawalpindi	0.85	15
Jhelum	0.65	35
Chakwal	0.66	34
Sargodha	0.48	52
Mianwali	0.88	12
Bhakkar	1	0
Khushab	1	0
Gujranwala	0.66	34
Hafizabad	1	0
Gujrat	0.73	27
Narowal	1	0
Mb din	0.84	16
Lahore	1	0
Kasur	1	0
Okara	0.80	20
Lodharn	1	0
Vehari	0.74	26
Sahiwal	0.65	35
Pakpattan	1	0
Khanewal	0.90	10
Faisalabad	0.79	21
T.T.singh	1	0
Jhang	0.82	18
DG Khan	0.94	6
Rajanpur	1	0
Muzaffargarh	1	0
Layyah	1	0
Bahawalpur	1	0
Bahawalnagar	0.74	26
RY Khan	1	0
Multan	0.15	85
Sheikhupura	0.95	5
Sialkot	058	42

Table 5 Technical Efficiency Scores under Sensitivity Analysis

DEISTRICTS	EFFICIENCY SCORE	%REDUCTION INPUT
Attock	1	0
Rawalpindi	1	0
Jhelum	0.93	7
Chakwal	1	0
Sargodha	0.84	16
Mianwali	1	0
Bhakkar	1	0
Khushab	1	0
Gujranwala	1	0
Hafizabad	1	0
Gujrat	0.92	8
Narowal	1	0
Mb din	1	0
Lahore	1	0
Kasur	1	0
Okara	0.93	7
Lodharn	1	0
Vehari	0.95	5
Sahiwal	0.81	19
Pakpattan	1	0
Khanewal	0.94	6
Faisalabad	1	0
T.T.singh	1	0
Jhang	1	0
DG Khan	0.92	8
Rajanpur	1	0
Muzaffargarh	1	0
Layyah	1	0
Bahawalpur	1	0
Bahawalnagar	0.93	7
RY Khan	1	0
Multan	0.88	12
Sheikhupura	1	0
Sialkot	0.88	12

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This study analyzed the utilization of health resources among districts of Punjab. DEA approach was used to measure the efficiency score. Infant mortality and maternal mortality were use as outputs and doctors, beds, BHU, RHU, maternal and child center and other health facilities were taken as inputs in the model. The above table shows that on average 66.5% districts were found efficient with score 1 (resources optimal utilization of resources). While 33.5% districts were found inefficient with less than 1 score (wastage of resources) .on the basis of these results there is a possibility for policy maker to make the policy which can be helpful optimal allocation of the resource. Under these results there is possibility of shuffling the resources from inefficient to efficient districts.

According to the outcomes 69 % districts were found efficient which shows the best utilization of resources in these districts. Only 31% districts were inefficient. Inefficient districts should decrease their input resources without changing in current output level y.

VII. Policy Implementations

According to the above findings, these studies provide some policy recommendations which are explaining as follow.

- Result shows that, there is wastage of resources in developed district of Punjab. While under developed districts providing efficient result. Therefore in the health services sector the preference should be given to those districts which are underprivileged.
- The health system of Pakistan is urban partiers & for affluent societies. There should be some policies that based on the rural and for the poor society.
- Social indicators shows that backward districts like Rajanpur, Pakpatan & Layyah are not considered to be good in health status, shows efficient allocation of resources. Which provide the direction for the policy maker that resource allocation should not be urban biased.

- Strengthen the health system of districts, by improving the institutions and their facilities through the improvement in technical and management faculty. District health strategies should be acclaiming the system for the review of the deaths in Neo-Natal and maternal So this will be better for the next time to understand the deficiencies in health services.
- The results show rationalize & support services for the stipulation of fundamental health care which is related to child care. All the services which relates to the districts level should be mingle. As more than 40 percent of births are handled by the untrained or unskilled attendant therefore there is a need to acquaint with a team of experts and professionally trained people who can further trained to the unskilled birth attendants.
- The BHU and RHU should be equipped with the latest machinery, medical laboratories and minor surgical instruments which are necessary for the basic health services so that the initial problem can be find out which is related to the diseases
- Many kinds of tobacco products are harmful for human body even it is intensively use in women it should be ban because it affect the MMR and IMR in this way the IMR and MMR can be decrease
- Like education emergency in Punjab there should be introduce health emergency as 40.5% posts of doctors are vacant in Punjab especially in rural areas there is a dearth of the health practitioners, M.Os and doctors. More than 600 BHU in Punjab have no Doctor. As there is no biometric or attendance system also. The health division of Government should introduce such technological systems in health So that the people can get basic health facilities.

- Where possible The BHUs should be given leased to the private doctors in public private partnership mode it will help to setup new BHUs and like many developing countries. There is also need to setup new pharmaceutical manufacture units.

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